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Effect of Salicylic Acid etc

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W. North

ON THE EFFECT OF SALICYLIC ACID ON THE BODY TEMPERATURE IN HEALTH, WITH SOME REMARKS ON THE TEMPERATURE OF THE URINE.

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IN the course of some experiments on the elimination of nitrogen made during the summer of last year, I was induced to observe the temperature of the urine and the effect of salicylic acid on the temperature of the body. I propose here simply to state the facts of the experiments and the results obtained.

During these experiments the diet was carefully regulated as to quantity and time of meals, and the urine was passed four times a day at fixed hours. The exact time at which the observations were made is shown in the accompanying tables.

Date.	When taken.	Temperature of Urine F°.	Temperature under Tongue F°.	Remarks.
May 6.	1.55 p.m.	98·4	98·4	After two hours' rest.
	7.15 p.m.	99·3	98·9	
	11.15 p.m.	98·3	98·0	
May 7.	8.0 a.m.	97·3	96·3	After short walk, half a mile.
	2.15 p.m.	99·2	97·7	
	7.0 p.m.	99·6	98·7	
May 8.	11.15 p.m.	98·1	97·6	Walk at 8.30.
	8.0 a.m.	97·1	97·0	
	2.0 p.m.	98·6	97·5	
	7.0 p.m.	98·9	98·5	
May 9.	11.30 p.m.	98·4	97·9	
	8.30 a.m.	97·1	97·1	
	2.0 p.m.	98·1	98·1	
	7.0 p.m.	98·4	98·1	
May 10.	11.15 p.m.	98·1	98·1	
	8.30 a.m.	97·3	97·3	
	2.0 p.m.	98·1	98·1	
	7.0 p.m.	98·3	98·3	
	11.0 p.m.	98·5	98·2	

Date.	When taken.	Temperature of Urine F°.	Temperature under Tongue F°.	Remarks.
May 11.	8.30 a.m.	97.5	97.5	
	2.0 p.m.	98.7	98.3	
	7.0 p.m.	98.9	98.9	
	11.30 p.m.	99.7	98.5	
May 12.	9.0 a.m.	99.3	97.7	
	3.0 p.m.	98.2	98.2	
	8.0 p.m.	98.5	98.5	
	12.0 p.m.	98.9	98.7	
May 13.	9.0 a.m.	97.7	97.7	
	2.15 p.m.	97.7	97.6	After short walk.
	7.15 p.m.	98.3	98.7	
	11.15 p.m.	98.4	97.3	
May 14.	8.0 a.m.	97.3	97.3	
	2.0 p.m.	98.5	98.0	
	7.30 p.m.	98.7	98.4	
	11.45 p.m.	98.3	98.3	
May 15.	9.0 a.m.	97.5	97.5	
	2.0 p.m.	98.6	98.1	
	5.0 p.m.	98.6	98.2	
	11.30 p.m.	98.5	98.4	After rowing.
May 16.	8.0 a.m.	97.1	97.1	
	2.0 p.m.	98.5	98.1	
	5.0 p.m.	99.1	98.1	
	9.0 p.m.	100.9	99.0	After rowing.
May 17.	8.0 a.m.	97.5	97.0	
	2.30 p.m.	98.7	98.1	
	5.0 p.m.	99.0	98.5	
	8.30 p.m.	100.4	98.4	After rowing.
May 18.	10.0 a.m.	97.5	97.1	
	2.0 p.m.	98.3	98.3	
	5.0 p.m.	98.9	98.3	
	8.30 p.m.	100.0	99.0	After rowing.
May 19.	11.0 a.m.	97.3	96.6	
	5.0 p.m.	99.0	98.1	After short walk.
	9.0 p.m.	98.9	98.6	
May 20.	9.30 a.m.	97.3	96.9	
	2.0 p.m.	98.5	98.5	
	5.0 p.m.	99.5	99.0	
	8.30 p.m.	99.9	99.0	After rowing.
May 21.	8.30 a.m.	97.3	95.7	
	2.0 p.m.	98.1	98.1	
	5.0 p.m.	98.4	98.3	
	8.30 p.m.	98.6	98.4	After rowing—eight upset.
May 22.	9.0 a.m.	96.6	96.5	
	2.0 p.m.	98.5	98.0	
	5.0 p.m.	98.8	98.6	
	9.15 p.m.	98.7	97.7	
May 23.	10.0 a.m.	97.1	97.0	

In the first experiment (May 6th to 23rd) no minute diary was kept, as was done in the second experiment (August 5th to 21st); and therefore my remarks will chiefly relate to the

latter. For convenience of reference I will call them A and B respectively.

Date.	Time.	Temperature of Mouth F°.	Temperature of Urine F°.	Remarks.
1878.				
Aug. 5.	2.0 p.m.	98.4	96.8	Working in the laboratory all day. No particular exercise.
	7.0 p.m.	99.0	99.4	
Aug. 6.	11.0 p.m.	98.4	98.8	Between 8.30 a.m. and 3.0 p.m. working in the laboratory. Dinner at 2.15 p.m.
	8.30 a.m.	97.2	97.4	
	2.0 p.m.	98.6	97.8	At 3.15 p.m. started on a walk of ten miles; the outward journey was performed at an average speed of four miles an hour.
	3.0 p.m.	99.0	—	
	3.35 p.m.	98.8		Rest of ten minutes or more.
	4.5 p.m.	98.8		
	4.30 p.m.	98.6	—	After walking between two consecu- tive milestones in a little less than thirteen minutes.
	4.40 p.m.	98.6		
	5.30 p.m.	99.5	—	After sitting for about an hour. Cold bath.
	6.10 p.m.	98.9		
Aug. 7.	7.0 p.m.	98.8	99.2	8.15—9.30 sharp walk of about six miles.
	7.45 p.m.	—	—	
	8.0 p.m.	98.7	—	Working all day in the laboratory. No particular exercise.
	10.20 p.m.	99.0		
	11.10 p.m.	98.5	97.8	Took .5 grm. salicylic acid (natural).
	8.45 a.m.	97.5	97.6	
	2.0 p.m.	98.6	98.6	Took 1 grm. salicylic acid.
	4.20 p.m.	98.8	—	
	7.0 p.m.	99.1	99.2	Took very sharp walk, lasting thirty- five minutes, about two-and-a-half miles.
	11.0 p.m.	98.7	98.9	
Aug. 8.	9.0 a.m.	97.4	97.0	8.15—9.30 p.m. sharp walk of about six miles; same as on Aug. 6th.
	12.40 p.m.	98.6		
	2.0 p.m.	98.5	98.4	Took 1 grm. salicylic acid. The acid has apparently produced no effect, unless a slight nausea and sick headache be attributed to it, more probably due to the heat of the laboratory.
	3.0 p.m.	98.6		
	3.15 p.m.	—	—	
	4.40 p.m.	98.6		
	5.15 p.m.	—	—	
	6.15 p.m.	98.6		
	6.20 p.m.	—	—	
	7.0 p.m.	99.2	99.9	
	11.0 p.m.	90.0	99.7	
	11.5 p.m.	—	—	
	12.0 p.m.	98.2	—	

Date.	Time.	Temperature of Mouth F°.	Temperature of Urine F°.	Remarks.
Aug. 9.	9.0 a.m.	97.4	97.6	Woke with a sense of numbness parieto-frontal. No headache.
	10.40 a.m.	98.2		
	10.45 a.m.	—	—	Took 1 grm. salicylic acid.
	11.45 a.m.	98.0	—	Bladder irritable.
	12.45 p.m.	98.0	—	Buzzing in the ears and slight deafness
	1.0 p.m.	—	—	Took 1 grm. salicylic acid.
	2.0 p.m.	97.6	97.5	
				Slight dizziness, and headache having improved, sharp walk about a mile
	2.30 p.m.	—	—	
	3.0 p.m.	98.4	—	Took 1 grm. salicylic acid.
	3.15 p.m.	—	—	Started on a walk of about six miles.
	3.45 p.m.	98.1	—	Rested about an hour.
	4.40 p.m.	98.1	—	Just before starting.
	5.0 p.m.	98.1	—	After walking twenty minutes at my utmost speed, with the thermometer in my mouth.
	5.40 p.m.	98.1	—	After return. Hearing decidedly indistinct, singing in the ears very annoying; considerable depression and langour.
	6.0 p.m.	—	—	Took 1 grm. salicylic acid.
	7.0 p.m.	98.4	98.8	
	9.0 p.m.	—	—	Conversation sounds distant and subdued; pupils considerably dilated; slight nausea; numbness and insensibility of scalp very marked.
Aug. 10.	9.30 p.m.	99.2	—	After short walk.
	11.0 p.m.	98.7	99.3	
	9.0 a.m.	97.4	97.8	
	12.20 p.m.	98.3	—	Hearing improved greatly, scalp still insensible.
	2.0 p.m.	98.0	98.2	
Aug. 11.	7.0 p.m.	98.8	99.4	
	11.0 p.m.	98.9	99.5	After short walk, about half a mile.
	9.0 a.m.	97.7	97.6	Working in the laboratory all day.
	2.0 p.m.	98.2	98.1	No particular exercise.
	7.0 p.m.	99.0	98.8	
Aug. 12.	10.30 p.m.	99.2	99.6	
	9.0 a.m.	97.4	97.6	
	2.0 p.m.	98.4	98.6	
	3.0 p.m.	—	—	Started on a walk of about nine miles.
	3.45 p.m.	98.4	—	After one-and-a-half miles gentle walking.
	3.56 p.m.	99.1	—	After ten minutes rapid walking.
	4.35 p.m.	98.3	—	After gentle walking and a rest of fifteen minutes.
	4.37 p.m.	—	—	Took one grm. salicylic acid.
	5.4 p.m.	98.1	—	After gentle walking.
	5.16 p.m.	98.5	—	After ten minutes very rapid walking.
	7.0 p.m.	98.2	98.9	
Aug. 13.	10.50 p.m.	98.4	99.0	
	1.45 a.m.	98.0	—	Working in the laboratory all night.
	3.45 a.m.	97.7		

Date.	Time.	Temperature of Mouth F°.	Temperature of Urine F°.	Remarks.
Aug. 13.	8.15 a.m.	97.5	97.5	7.30—8.30 walked about two-and-a-half miles.
	2.0 p.m.	98.2	98.2	
	6.30 p.m.	98.4	98.6	
Aug. 14.	11.0 p.m.	98.6	98.6	3.0—5.30 p.m. rowed about six miles in a heavy boat, last two miles without stopping. Cold bath.
	9.15 a.m.	97.2	97.4	
	2.0 p.m.	98.2	98.4	
Aug. 15.	6.0 p.m.	—	—	7.30—9.30 p.m. same walk as on Aug. 8th, trotted last three-quarters of a mile on returning.
	6 50 p.m.	98.4	98.2	
	11.0 p.m.	98.2	98.8	
	9.15 a.m.	97.6	97.6	
	2.30 p.m.	98.0	98.4	
Aug. 16.	6.30 p.m.	98.3	98.8	All night in the laboratory.
	10.0 p.m.	99.4	100.1	
	11.0 p.m.	98.0	99.0	
	2.30 a.m.	97.4	—	
	9.15 a.m.	97.4	97.4	
Aug. 17.	2.0 p.m.	98.0	98.4	2.45—4.15 p.m. walked about five miles. 9.30—10.0 p.m. sharp walk one-and-a-half miles. 10.0—10.45 singing.
	7.0 p.m.	98.4	98.7	
	11.0 p.m.	98.1	98.3	
	9.30 a.m.	97.6	97.6	
	2.0 p.m.	97.8	98.2	
Aug. 18.	6 30 p.m.	98.2	98.6	7.0 p.m. short sharp walk, half a mile.
	10.55 p.m.	98.8	99.5	
	9.20 a.m.	97.6	97.9	
	2.0 p.m.	98.9	99.0	
	7.20 p.m.	98.8	99.3	
Aug. 19.	11.0 p.m.	98.8	99.2	8.30 p.m. sharp walk about one-and-a-half miles. All night in the laboratory. Walked about two-and-a-half miles.
	10.0 a.m.	97.8	97.6	
	2.30 p.m.	98.2	98.2	
Aug. 20.	6.30 p.m.	98.2	98.2	
	11.0 p.m.	98.0	98	
	9.30 a.m.	97.4	97.7	
	2.30 p.m.	98.0	98.0	
Aug. 21.	7.30 p.m.	98.0	98.4	
	11.15 p.m.	98.1	98.4	
	6.0 a.m.	—	—	
	8.0 a.m.	97.3	97.8	
	2.0 p.m.	98.2	98.2	

N.B.—Where no remarks are made as to occupation, &c., the time was spent in the laboratory.

The temperature of the urine was taken by allowing it to flow at the time of passing over the bulb of an ordinary small clinical thermometer, placed as near the ureters as possible, another thermometer being at the same time placed under the tongue, and kept there for about seven minutes.

The one obvious fact is, that as a rule, and indeed with hardly an exception, the temperature of the urine was higher than that of the mouth. In addition we may notice, that whilst both were raised by exercise, the urine was apparently more readily affected and to a greater degree than the mouth; and further, that the morning temperatures, on waking, were almost identical. I may here state that my own temperature is, as a rule, slightly below average.

Considering, first, Experiment A, the highest temperature appears generally to have been reached about seven o'clock in the evening, the difference between the maximum and minimum being often as much as two degrees before the rowing was begun. All the exceptionally high urine temperatures were taken after some more or less severe exercise — walking or rowing.

The effect of the rowing is very marked, the temperature of the urine on May 16th at 9 P.M. being $100^{\circ}9$ F., and $100^{\circ}4$ F. at 8.30 P.M. on May 17th; and a considerable rise is exhibited on the other days.

The more accurate observations of Experiment B exhibit the same general results, but the record of exercise of the action of the salicylic acid enables us to amplify them considerably.

On August 5th the ordinary difference between the two is shown, viz., about half a degree, though what is the explanation of the high temperature of the mouth at 2 P.M. compared with that of the urine passed at the same time it is difficult to say. It can hardly have been an error of observation, as it occurred twice on August 6th and again on August 8th, 9th, and 11th, and in the previous experiment on May 13th.

The observations of August 6th were intended to show the extent to which the temperature of the mouth could be raised by exercise. It is to be remarked that the temperature of the mouth at seven o'clock on August 7th was nearly as high without any special exercise, which leads to the conclusion that the

salicylic acid did not affect the seven o'clock temperature on August 8th. But when we come to the data obtained on August 9th, there appears to be no doubt but that the effect of the drug was considerable; not let it be noticed, in lowering the temperature so much as in preventing the rise which previous experiments show would normally have taken place.

The quantity of acid taken on August 12th appears to have been insufficient to do more than *check* the rise of temperature, and the effect passed off rapidly.

The general results of these observations may be summed up as follows :—

(1) That the temperature of the urine is probably always higher than that of the mouth.¹

(2) That whilst exercise raises the temperature both of the mouth and the urine, the latter is much more readily affected than the former, and perhaps in a greater degree.

(3) That salicylic acid affects both temperatures, but the mouth more than the urine, rather preventing a rise than causing a fall.

(4) That whatever be the causes of the ordinary daily variations of temperature, they affect the urine as well as the mouth.

I may state in conclusion that I have failed to establish any connection between the rise of temperature and the quantity of the urine, or of its constituents, which might be expected, on the supposition that the kidney is an actively secreting organ; but, considering the methods of observation used, this proves little or nothing.

I append the results of some further observations on the temperature of the rectum and urine, from which it appears that the rectum temperature is generally higher than that of the urine. And also some temperatures in typhoid fever, kindly obtained for me by Mr. Fowler, House Physician at Addenworth's Hospital, Cambridge.

¹ I have observed an obvious connection between the temperature of the urine and its quantity. Observations on small quantities are probably of very little value.

Date.	When taken.	Temperature of Urine.	Temperature of Rectum.	Temperature of Mouth.	Temperature of Thigh.	Remarks.
1878.						
Oct. 9.	12.0 midnight.	98.0	98.4	—	—	After sitting for two hours.
Oct. 10.	8.0 a.m.	98.0	98.4			
	2.0 p.m.	98.6	98.9	97.9	—	After three hours' sitting.
	7.30 p.m.	98.8	99.4	98.3		Dinner at 6.30.
Oct. 11.	11.0 p.m.	100.4	101.1	99.3	—	After one hour's very rapid walking.
	8.0 a.m.	98.0	98.3			
	11.15 a.m.	98.6	98.8	—	—	After one hour's sitting.
	12.45 p.m.	99.2	100.6	—	—	After a walk about two miles.
	3.30 p.m.	99.2	99.7	—	—	After two hours' standing.
Oct. 12.	9.15 p.m.	98.6	99.0	97.9	97.5	After sitting some time.
	12.30 a.m.	97.8	98.1	97.5	—	After four hours' sitting.
	8.0 a.m.	98.0	98.2	96.6	—	Taken before rising.
	„ „	—	98.2	—	—	Taken twenty minutes after in order to observe the effect, if any, of the vertical position.
Oct. 13.						The low temperature of the mouth is probably due to my having taken some cold water a few minutes previously.
	11.15 a.m.	99.0	99.5	—	—	After short sharp walk.
	1.45 p.m.	98.7	99.0	97.6	—	After sitting.
	4.15 p.m.	98.8	99.4	98.7	—	
	11.15 p.m.	99.0	100.0	—	—	After three hours' standing.
	10.45 a.m.	98.0	98.4			
Oct. 14.	3.0 p.m.	98.8	98.9	98.0	—	After three hours' sitting.
	9.30 p.m.	98.2	98.4	97.6	—	After two hours and a half sitting. Dinner at 6.30.
	3.15 a.m.	98.0	98.4	97.4	—	After five hours' sitting.
	12.0 noon	98.4	98.8	98.0	—	After two hours' sitting.
	5.0 p.m.	98.8	99.0	97.6	—	After three hours' sitting.

TEMPERATURE IN TYPHOID FEVER.

Axilla.	Urine.
103.8	105.8
103.6	105.2
(?) 101.2	105.2
101.2	103.2
103.4	104.0
103.6	105.0
99.6	101.2

